What is claimed:

1. A method for real-time measurement of ultrashort laser pulses comprising:

recording in a computer measured frequency resolved optical gating (FROG) trace data, the FROG trace data generated by processing a pulse in a FROG device;

processing the measured FROG trace to perform real time phase retrieval and generating in real time a retrieved pulse from the measured FROG trace;

displaying the retrieved pulse; and

generating in real time a feedback parameter providing information characterizing the real time phase retrieval.

2. The method of claim 1 where the feedback parameter is the FROG trace error.

3. The method of claim 1 where the feedback parameter is a display of the measured and retrieved FROG traces.

4. The method of claim 1, where the real time phase retrieval uses a previous result as a starting point for a subsequent retrieval.

5. The method of claim 1, further comprising determining a background correction factor providing a minimum FROG trace error.

6. The method of claim 1, further comprising:

recording a signal pulse with a camera, the signal pulse generated within the FROG device from the pulse, the camera performing gamma correction;

producing the measured FROG trace from output of the camera; and

preprocessing the measured FROG trace to reverse the gamma correction implemented during measurement of the measured FROG trace.

7. The method of claim 1, further comprising filtering the measured FROG trace to reduce a magnitude of artifacts in the measured FROG trace prior to the real time phase retrieval processing.

8. The method of claim 1, further comprising analog processing of a spectrogram corresponding to the pulse, the analog processing prior to generating the retrieved pulse.

9. The method of claim 1, wherein the real time phase retrieval comprises principal component generalized projections processing.

10. A method of performing real time phase retrieval processing of frequency resolved optical gating (FROG) traces, the method comprising:

receiving as input a measured FROG trace data set, the FROG trace data set generated by processing a pulse in a FROG device;

processing the measured FROG trace data set to perform real time phase retrieval and generating in real time a retrieved pulse from the measured FROG trace;

generating displays of the retrieved pulse at a rate of 3 Hz or faster; and

generating a feedback parameter providing information characterizing the real time phase retrieval.

11. The method of claim 10, wherein the method is embodied in a computer program product.

12. The method of claim 11, further comprising selectively preprocessing the measured FROG trace data set to apply a reverse gamma correction to the measured FROG trace data set.

13. A method of performing real time phase retrieval processing of frequency resolved optical gating (FROG) traces, the method comprising:

receiving as input a measured FROG trace data set, the FROG trace data set generated by processing a pulse in a FROG device;

processing the measured FROG trace data set to perform real time phase retrieval and generating in real time a retrieved pulse from the measured FROG trace;

generating in real time a display of the retrieved pulse; and

generating in real time a feedback parameter providing information characterizing the real time phase retrieval; and

performing a control operation in response to the feedback parameter.

14. The method of claim 13, wherein the control operation comprises restarting the phase retrieval process.

15. The method of claim 14, wherein the restarting the phase retrieval process takes as an input a Gaussian pulse having random phase.

16. The method of claim 14 where the feedback parameter is the FROG trace error.

17. The method of claim 13 where the feedback parameter is a simultaneous real time display of the measured and retrieved FROG traces.

18. The method of claim 13, further comprising selectively filtering the measured FROG trace data set prior to the real time phase retrieval processing, the selectively filtering responsive to user inputs.

19. The method of claim 13, further comprising selectively analog processing a spectrogram corresponding to the pulse, the selectively analog processing prior to generating the retrieved pulse.

20. The method of claim 13, further comprising selectively preprocessing the measured FROG trace data set to apply a reverse gamma correction to the measured FROG trace data set.

21. The method of claim 13, wherein the measured FROG trace data set is received from a frame grabber.